

REMARKS

I. SUMMARY OF EXAMINER'S OBJECTIONS AND REJECTIONS

In the Office Action, Claims 5-15 were rejected under 35 U.S.C. § 112, second paragraph, for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention based on a view that it is indefinite as to how the word "transposer" limits the scope of the pad and how "feed" limits the scope of a through hole. Claims 1-9 and 16-18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Shokrgozar et al. (U.S. Patent No. 5,434,745) in view of Wen-Chen (U.S. Patent No. 6,269,003 B1) based on a view that it would have been obvious to one of ordinary skill in the art to incorporate flow channels within Shokrgozar et al. to provide heat ventillation as taught in Wen-Chen. Claim 12 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Shokrgozar et al. based on a view that it would have been obvious to one of ordinary skill in the art to form the package of Shokrgozar et al. as a BGA, since a BGA is a type of conventional surface mount well known at the time the invention was made for increased density. Claim 19 was rejected under 35 U.S.C. § 103(a) as being unpatentable based on a view that it would have been obvious to one of ordinary skill in the art as a matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to chose these particular dimensions because applicant has not disclosed that the dimension are for a particular unobvious purpose, that produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Claims 13-15, and 20 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Shokrgozar et al. and Wen-Chen based on a view that it would have been obvious to one of ordinary skill in the art to modify the combined structure of Shokrgozar et al. and Wen-Chen with a heat sink interposed

between the chip stack in order to improve heat dissipation as taught by Kato (U.S. Patent No. 5,051,865).

II. APPLICANTS' RESPONSE

In the Office Action, Claims 5-15 were rejected under 35 U.S.C. § 112, second paragraph, for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention based on a view that it is indefinite as to how the word "transposer" limits the scope of the pad and how "feed" limits the scope of a through hole. In response, the Applicants have amended Claim 8 by deleting the term "feed-" appropriately, as shown in attached document captioned "Versions with markings to show changes made."

In relation to the term "transposer" as recited in Claims 5-7, Applicants respectfully submit that the adjective "transposer" is used to distinguish between the various types of pads recited in the claims, namely carrier pads, ring pads, and transposer pads. In this regard, although the term "transposer" does not limit the claims, the term aids in maintaining the claims' clarity thereby satisfying the threshold requirement of clarity and precision.¹ Hence, Applicants respectfully submit that Claims 5-15 as amended overcomes the Examiner's rejection under 35 U.S.C. § 112, second paragraph, for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Examiner rejected Claim 1 under 35 U.S.C. § 103(a) as being unpatentable over Shokrgozar et al. in view of Wen-Chen based on a view that it would have been obvious to one of ordinary skill in the art to incorporate flow channels within Skokrgozar et al. to provide heat

¹ "The examiner's focus during examination of claims for compliance with the requirement for definiteness of 35 U.S.C. 112, second paragraph is whether the claim meets the threshold requirements of clarity and precision, not whether more suitable language or modes of expression are available." M.P.E.P. § 2173.02.

ventilation as taught in Wen-Chen. In response, Claim 1 has been amended to clarify the invention claimed claiming "at least one thermal ring ... including at least two unimpeded flow channels; the flow channels being operative to facilitate the circulation of air directly over the integrated circuit chip disposed between the carrier layers."

The disclosures of the cited prior art, namely Shokrgozar et al. and Wen-Chen does not disclose two elements that are claimed in Claim 1, specifically 1) unimpeded flow channels 2) to facilitate the circulation of air directly over the integrated circuit chip disposed between the carrier layers. In the Office Action, the Examiner relied on Wen-Chen for the teachings of flow channels. However, as shown in Fig. 3 of Wen-Chen, the flow channel is impeded based on a view that the rearward lateral wall of item 17 has holes and is not notched.²

Furthermore, Applicants respectfully submit that the flow channels disclosed in Wen-Chen do not facilitate the circulation of air directly over the integrated circuit chip disposed between the carrier layers. Rather, Wen-Chen discloses circulation of air indirectly over the integrated circuit but directly over the heat sink fins, as shown in Figs 3-4. As such, the cited prior art is unable to render Claim 1 prima facie obvious based on a view that all of the claim limitations is not taught or suggested by the prior art.

Even if Wen-Chen did disclose or suggest 1) unimpeded flow channels 2) to facilitate the circulation of air directly over the integrated circuit chip disposed between the carrier layers, there is no motivation to modify Shokrgozar et al. to make the invention claimed in Claim 1 based on a view that modifying Shokrgozar et al. would render the prior art invention being modified

² For the flow channels to be considered unimpeded, the rearward wall of item 17 must be notched and not only drilled with holes. Applicant respectfully submits that the volumetric flow of air for impeded air flow is less than unimpeded air flow.

unsatisfactory for its intended purpose. In this regard, as understood, the intended purpose of the invention disclosed in Shokrgozar et al. is to test the integrated circuit at its maximum temperature.³ If the invention disclosed in Shokrgozar et al. were modified with flow channels that facilitate direct air flow over an integrated circuit, then the integrated circuit would not be able to heat up to maximum temperature based on a view that the flow channels will effectuate heat transfer so as to prevent the integrated circuit from reaching temperature extremes. As such, the prior art invention would be rendered inoperative for testing integrated circuit at temperature extremes.

Additionally, there is no motivation to modify Shokrgozar et al. with flow channels based on a view that the flow channels will serve no functional purpose. As understood, after a period of time, the flow channels will not dissipate heat generated by the integrated circuit (IC) based on a view that the air next to the integrated circuit will match the ambient temperature of the closed system, namely that of the inner cavity of the outside enclosure.⁴ In particular, the air heated by the IC will be transferred to the inner cavity of the outside enclosure and the air within the inner cavity of the outside enclosure will be transferred next to the IC. In this manner, the ambient temperature inside the outside enclosure will rise to/equal the temperature of the air heated by the IC. As such, the flow channels will not serve to effectuate heat transfer.

Even if there was motivation to incorporate flow channels to the outside enclosure, the invention of Shokrgozar et al. would be rendered unsatisfactory for its purpose of testing the IC at temperature extremes, as discussed above. Hence, Claim 1 is believed to be allowable.

³ This is evidenced in Shokrgozar et al. itself stating that "the unit can be tested at temperature extremes." Shokrgozar et al., Col. 2, Ln. 63.

⁴ The term "outside enclosure" as used by the Applicants refer to item 30, 31, and 32 of the disclosure in Shokrgozar et al.

The dependent claims of Claim 1 is also believed to contain novel and unobvious patentable subject matter. For example, Claim 18 claims flow channels that "extend from the top surface of the thermal ring to depth of approximately one-half the ring thickness." In this regard, as understood, the disclosure of Wen-Chen would teach extending the flow channel to the maximum depth of the ring to increase the heat transfer surface contact area and not merely to one half the depth of the ring.⁵ As such, the cited prior art does not disclose, suggest, or motivate one of ordinary skill in the art to make the invention claimed in Claim 18.

III. APPLICANTS' REQUEST

For the foregoing reasons, Applicants respectfully submit that all the stated grounds of rejections have been overcome, and that Claims 1-20 are in condition for allowance. An early Notice of Allowance is therefore respectfully requested.

Should the Examiner have any suggestions for expediting allowance of the application, the Examiner is invited to contact the Applicants' representative at the telephone number listed below.

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⁵ Wen-Chen, Col. 2, Lns. 15-31.

Application No. 09/536,233

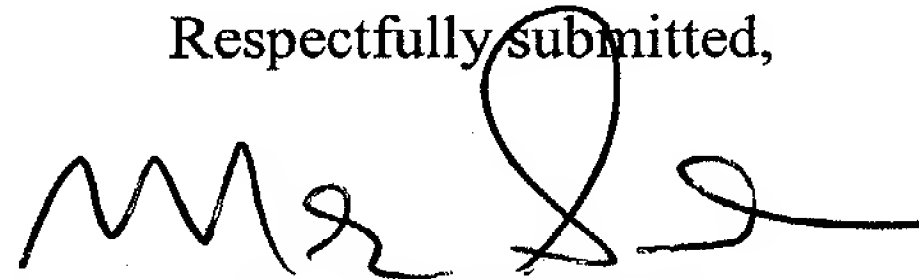
Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version with markings to show changes made".

Respectfully submitted,

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5/30/02

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

1. A chip stack comprising:

at least two carrier layers, each of the carrier layers including a first conductive pattern disposed thereon;

at least one thermal ring having a second conductive pattern disposed thereon and including at least two unimpeded flow channels disposed therein, the thermal ring being disposed between the carrier layers, with the second conductive pattern being electrically connected to the first conductive pattern of each of the carrier layers; and

at least two integrated circuit chips electrically connected to respective ones of the first conductive patterns, one of the integrated circuit chips being circumvented by the thermal ring and disposed between the carrier layers;

the flow channels being operative to facilitate the circulation of air directly over the integrated circuit chip disposed between the carrier layers.

8. The chip stack of Claim 6 wherein:

each of the ring pads of the first set is electrically connected to a respective one of the ring pads of the second set via a ring ~~feed~~-through hole; and

each of the carrier pads of the second set is electrically connected to a respective one of the carrier pads of the third set via a carrier ~~feed~~-through hole.